

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

RIPARIAN FOREST BUFFER

(Acre)
CODE 391A

DEFINITION

An area of predominantly trees and/or shrubs located adjacent to and up-gradient from water courses or water bodies.

PURPOSES

- * Create shade to lower water temperatures to improve habitat for fish and other aquatic organisms.
- * Provide a source of detritus and large woody debris for aquatic organisms.
- * Create wildlife habitat and establish wildlife corridors
- * Reduce excess amounts of sediment, organic material, nutrients, pesticides and other pollutants in surface runoff and reduce excess nutrients and other chemicals in shallow ground water flow.
- * To provide a harvestable crop of timber, fiber, forage, fruit, or other crops consistent with other intended purposes.
- * To provide protection against scour erosion within the floodplain.
- * Restore natural riparian plant communities.
- * Increase aesthetic value.

CONDITIONS WHERE PRACTICE APPLIES

On stable areas adjacent to permanent or intermittent streams, lakes, ponds, wetlands and areas with ground water recharge.

There are potentially three management zones that are applied in a riparian forest buffer depending upon intended purposes and site conditions.

Management zone 1 is the zone immediately adjacent to the water. Vegetation is normally dominated trees and shrubs.

Management zone 2 is upgrade of zone 1 and contains trees and shrubs where more intensive management is allowed to help accomplish an intended objective.

Management zone 3 is upgrade of management zone 2 and is herbaceous material.

CRITERIA

**GENERAL CRITERIA APPLICABLE TO ALL
PURPOSES NAMED ABOVE**

The location, layout, and density of the riparian forest buffer will accomplish the intended purpose and function. See General Specifications for required plant densities for buffer plantings. All buffers will consist of zone 1 that begins at the normal water line, or at the upper edge of the active channel or shore (top of the bank), and extend a minimum distance of 15 feet, measured horizontally on a line perpendicular to the water course or water body.

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resource Conservation Service.
--

Standard - 391A-2

Dominant vegetation will consist of existing or planted trees and shrubs suited to the site and the intended purpose. Selection of locally grown native species will be a priority when feasible. Plantings will consist of two or more species with individual

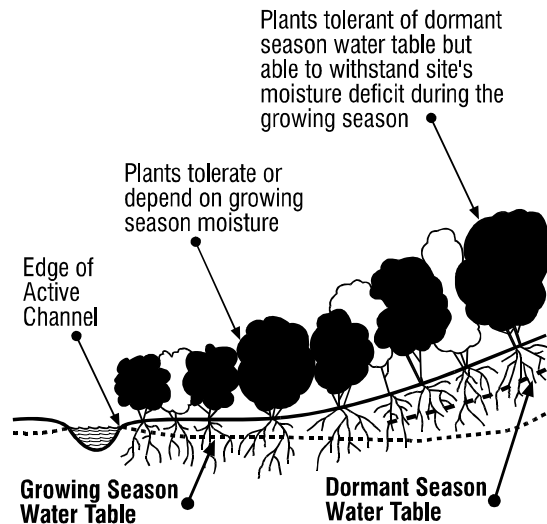


Figure 1. Plant adaptation to soil moisture.

Occasional removal of some tree and shrub products such as high value trees is permitted provided the intended purpose is not compromised by the loss of vegetation or harvesting disturbance. Felling and skidding of trees shall be directed away from the water course or water body. Skidding will be done in a manner to prevent creation of ephemeral channels.

An adequate upstream or adjacent seed source must be present when using natural regeneration to establish a buffer.

Necessary site preparation and planting for establishing new buffers shall be done at a time and manner to insure survival and growth of selected species. Refer to General Specifications for care, handling, and planting requirements for woody planting stock.

Only viable, high quality, and adapted planting stock will be used. Refer to General Specifications for size and quality requirements for woody planting stock.

plants suited to the seasonal variation of soil moisture status of individual planting sites. Plant types and species shall be selected based on their compatibility in growth rates and shade tolerance.

The method of planting for new buffers shall include hand or machine planting techniques. It will be suited to achieving proper depths and placement of planting stock roots, and not impair the intended purpose and function of the buffer.

Site preparation shall be sufficient for establishment and growth of selected species and be done in a manner that does not compromise the intended purpose. See General Specifications for detailed site preparation procedures. Supplemental moisture will be applied if and when necessary to assure early survival and establishment of selected species.

Livestock shall be controlled or excluded as necessary to achieve and maintain the intended purpose. Large wildlife species such as deer and elk may have to be excluded until new plantings are well established. Water course crossings and livestock watering shall be located and sized to minimize impact to buffer vegetation and function. On established buffers included within grazed areas, set utilization rates of key woody browse to allow woody vegetation to regrow sufficiently for its intended function. Impairment of buffer function by livestock and wildlife overuse (trampling, compaction or over-utilization of woody plants) shall require immediate removal of livestock from the riparian area. Control of wildlife will have to be in compliance with state regulations which may include working with the local NM Game and Fish representative on depredation hunts.

Harmful pests present on the site will be managed or eliminated as necessary to achieve and maintain the intended purpose.

Comply with applicable laws and regulations, including the state Best Management Practices (BMP).

All practices and procedures that involve ground disturbing activities will be in compliance with applicable Cultural Resource Protection laws, regulations, and policies.

**ADDITIONAL CRITERIA TO PROVIDE HABITAT FOR
AQUATIC ORGANISMS AND TERRESTRIAL WILDLIFE.**

Zone 1 width will be expanded to meet the minimum requirements of the wildlife or aquatic species and associated communities of concern.

Establish plant communities and successional stages that address the target wildlife needs and existing resources in the watershed.

**ADDITIONAL CRITERIA TO REDUCE EXCESS AMOUNTS
OF SEDIMENT, ORGANIC MATERIAL, NUTRIENTS,
PESTICIDES AND OTHER POLLUTANTS IN SURFACE
RUNOFF AND REDUCE EXCESS NUTRIENTS AND OTHER
CHEMICALS IN SHALLOW GROUND WATER FLOW.**

An additional strip or area of land, zone 2, will begin at the edge and up-gradient of zone 1 and extend a minimum distance of 20 feet, measured horizontally on a line perpendicular to the water course or water body. The minimum combined width of zones 1 and 2 will be 100 feet or 30 percent of the geomorphic flood plain whichever is less, but not less than 35 feet. (Note: The geomorphic flood plain may be narrower than the valley bottom if the valley formed under different hydrologic conditions.) Figure 2 illustrates

examples of zone 1 and 2 widths for water courses and water bodies.

Criteria for zone 1 shall apply to zone 2 except that removal of tree and shrub products such as timber, nuts and fruit is permitted on a periodic and regular basis provided the intended purpose is not compromised by loss of vegetation or harvesting disturbance.

Zone 2 will be expanded in high nutrient, sediment, and animal waste application areas, where the contributing area is not adequately treated or where an additional level of protection is desired.

Management zone 3 shall be added to the riparian buffer when adjacent to cropland or other sparsely vegetated or highly erosive areas. Management zone 3 will be designed to manage concentrated flow erosion, excessive sheet and rill erosion or mass soil movement and maintain sheet flow. Erosion control in this area shall be designed in accordance with the Filter Strip Practice Standard (393A) as found in the FOTG.

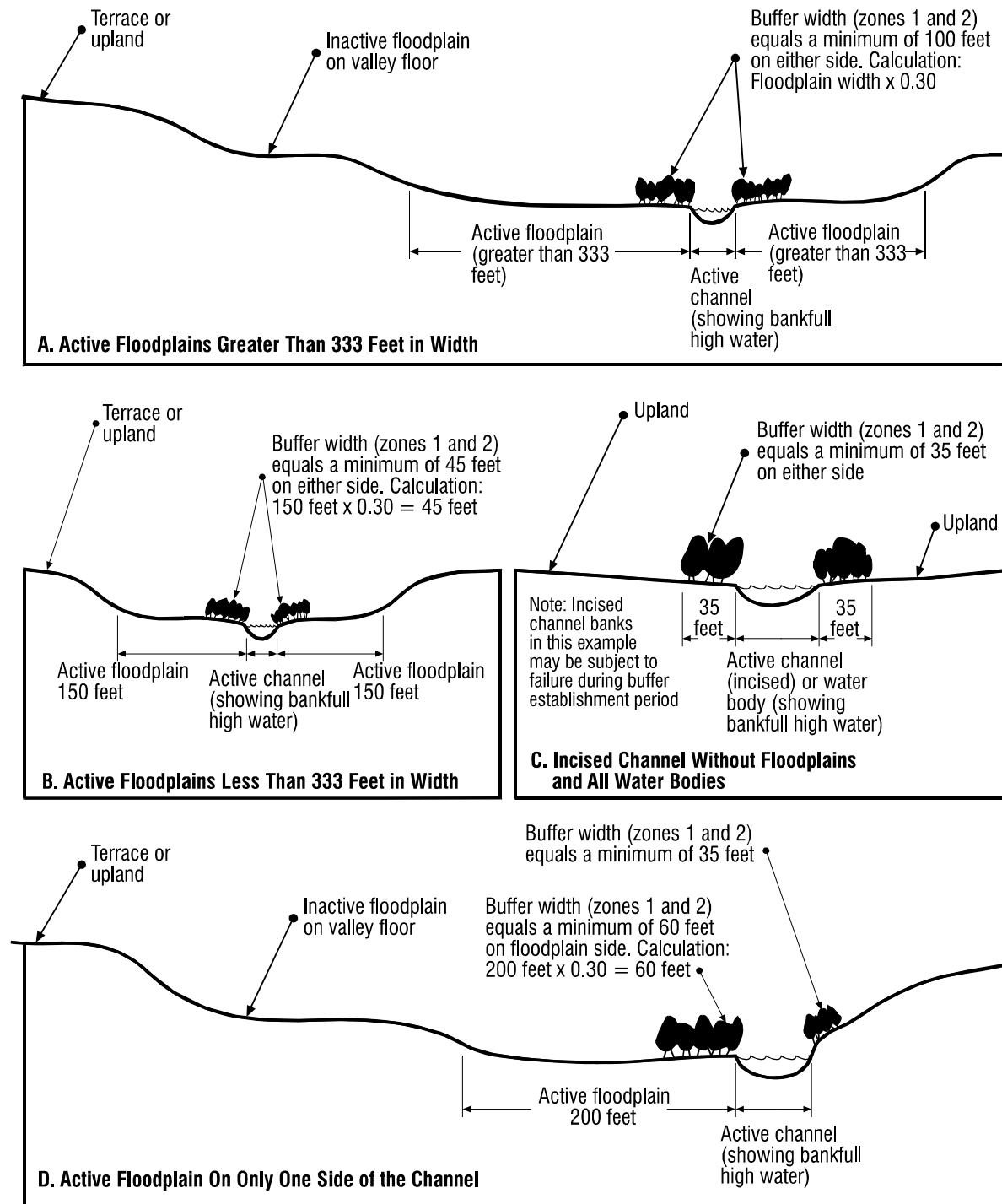


Figure 2. Examples of riparian forest buffer widths for water courses and water bodies.

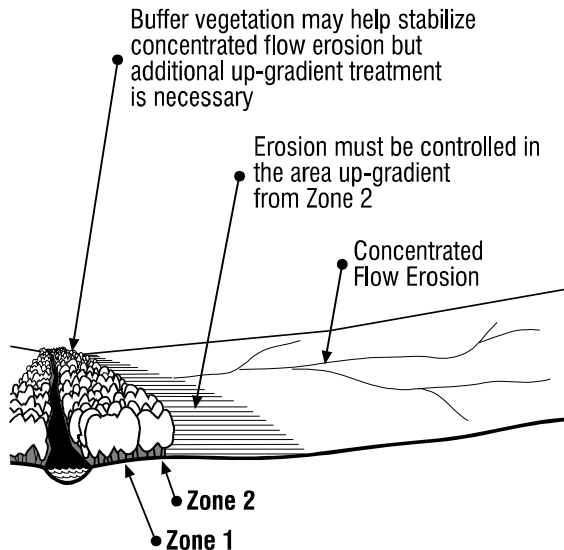


Figure 3. Control of concentrated flow erosion.

ADDITIONAL CRITERIA TO CREATE SHADE TO LOWER WATER TEMPERATURES TO IMPROVE HABITAT FOR FISH AND OTHER AQUATIC ORGANISMS.

A buffer for lowering warm-season water temperatures shall consist of at least zone 1 for water course reaches or water bodies less than or equal to 30 feet in width or water bodies greater than 30 feet wide but less than 1 acre. (Note: Buffers for wider water courses or larger water bodies may be valuable but will have only site-specific effects.) Buffers shall be established or maintained on south and west sides of water courses and bodies insofar as practical. The buffer canopy shall be established to achieve at least 50 percent crown cover with average canopy heights equal to or greater than the width of the water course or 30 feet for water bodies. See figure 4.

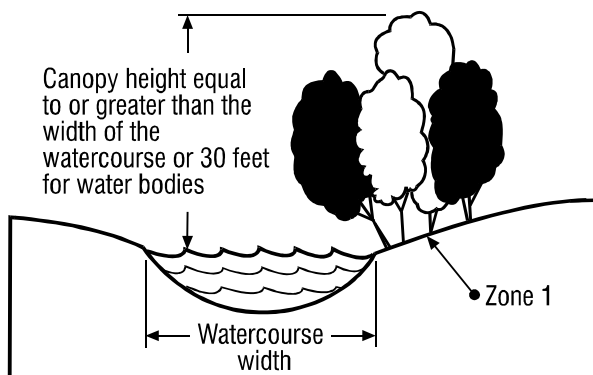


Figure 4. Canopy height for water temperature control.

Buffer species shall include those species suited to the site, with sufficient height potential. Place drooping or wide-crowned trees and shrubs nearest the water course or body. Shoreline or channel relief (e.g., deeply incised channels) and topographic shading will be taken into account in selecting species.

ADDITIONAL CRITERIA TO PROVIDE A SOURCE OF DETRITUS AND LARGE WOODY DEBRIS FOR FISH AND OTHER AQUATIC ORGANISMS.

Within zone 1 as a minimum, establish, favor or manage species capable of producing stems and limbs of sufficient size to provide an eventual source of large woody debris for in-stream habitat for fish and other aquatic organisms.

ADDITIONAL CRITERIA TO REDUCE EXCESS AMOUNTS OF SEDIMENT, ORGANIC MATERIAL, NUTRIENTS, PESTICIDES, AND OTHER POLLUTANTS IN SURFACE RUNOFF AND REDUCE EXCESS NUTRIENTS AND OTHER CHEMICALS IN SHALLOW GROUND WATER FLOW.

Concentrated flow erosion or mass soil movement shall be controlled in the up-gradient area immediately adjacent to zone 2 prior to establishment of the riparian forest buffer. This area is delineated and identified as zone 3. Zone 3 shall be designed in accordance with criteria in the Filter Strip (393A) standard in the FOTG for riparian forest buffers established on agricultural lands. On forested lands, zone 3 would be vegetated with trees that receive some management.

CONSIDERATIONS

The severity of bank erosion and its influence on existing or potential riparian trees and shrubs should be assessed. Watershed-level treatment or bank stability activities may be needed before establishing a riparian forest buffer.

Complex ownership patterns of riparian areas may require group planning for proper buffer design, function and management.

Where ephemeral, concentrated flow or sheet and rill erosion and sedimentation is a concern in

Standard - 391A-6

the area up-gradient of zone 3, consider the application of a vegetated strip consisting of grasses and forbs. Stiff-stemmed grasses established at the up-gradient edge of zone 3 will accelerate deposition of sediment. See figure 5. When concentrated flow or excessive sheet and rill erosion and sedimentation cannot be controlled with vegetation, consider structural or mechanical treatments.

Joining of existing and new buffers increase the continuity of cover and will further moderate water temperatures. A mix of species with growth forms that are tall and wide-crowned or drooping will increase moderation effects. For water courses, buffers established on both sides will enhance multiple values.

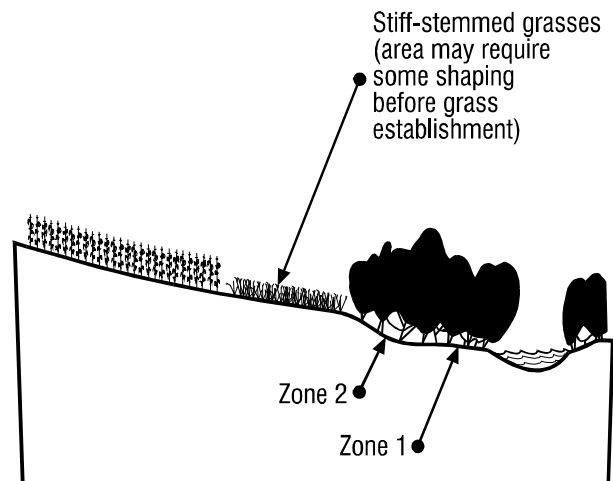


Figure 5. Sediment-trapping above zone 3.

Favor tree and shrub species that are native and have multiple values such as those suited for timber, biomass, nuts, fruit, browse, nesting, aesthetics and tolerance to locally used herbicides. Consider species that resprout when establishing new rows nearest to water courses or bodies. For detritus and large woody debris, use species that will meet the specific requirements of fish and other aquatic organisms for food, habitat, migration and spawning.

Use recommendations from regional or other large-scale evaluations and plans when designing, locating and connecting buffers for indicator and/or target species of wildlife, fish

and other aquatic organisms. The Buffer Width Guide for Selected Wildlife Species in General Specifications contains guide widths for key species.

Avoid tree and shrub species which may be alternate hosts to undesirable pests or that may be considered noxious or undesirable. Species diversity should be considered to avoid loss of function due to species-specific pests.

Problem woody phreatophytes (plants that obtain water by the penetration of their roots into the water table such as salt cedar) and hydrophytes that deplete ground water should be used with extreme caution in New Mexico.

The location, layout and density of the buffer should complement natural features. Avoid layouts and locations that would concentrate flood flows or return flows. Low, flexible-stemmed shrubs will minimize obstruction of local flood flows. Avoid establishing buffers in windthrow prone locations.

Consider the positive and negative impacts beaver, muskrat, deer, elk, rabbits and other local species may have on establishment success and the successful management of riparian and stream systems. Temporary and local population control methods of these kinds of local species should be used cautiously and within state and local regulations. These animals are a part of a successful balanced system and should not be permanently eliminated.

Consider the type of human use (rural, suburban, urban) and the aesthetic, social and safety aspects of the area to determine the vegetation selection, arrangement and management. For example, avoiding shrubs that block views and pruning low tree branches near recreation trails allows for ease of patrolling.

Species selection criteria to improve aesthetics include seasonal foliage color, showy flowers and fruit, foliage texture, form and branching habit. The layout and design should be appropriate for the setting as determined by adjacent land uses. A landscape analysis can help determine specific aesthetic requirements.

Many riparian areas in New Mexico are groundwater discharge areas. Buffer design and plant selection will effect soil water hydrology and temperature. Compliance with this specification will lower soil water temperatures and improve hydrology.

PLANS AND SPECIFICATIONS

Specifications for this practice shall be prepared for each site. Specifications shall be recorded using approved specifications sheets, job sheets, narrative statements in the conservation plan, or other acceptable documentation. Requirements for operation and maintenance of the practice shall be incorporated into site specifications.

OPERATION AND MAINTENANCE

The following actions shall be carried out to insure that this practice functions as intended throughout its expected life. These actions include normal repetitive activities in the application and use of the practice (operation), and repair and upkeep of the practice (maintenance):

The riparian forest buffer will be inspected periodically, protected and restored as needed, to maintain the intended purpose from adverse impacts such as excessive vehicular and pedestrian traffic, pest infestations, pesticide use on adjacent lands, livestock damage and fire.

Replacement of dead trees or shrubs and control of undesirable vegetative competition will be continued until the buffer is, or will progress to, a fully functional condition.

As applicable, control of concentrated flow erosion or mass soil movement shall be continued in the up-gradient area immediately adjacent to zone 3 to maintain buffer function.

Any removals of tree and shrub products shall be conducted in a manner that maintains the intended purpose.

For purposes of moderating water temperatures and providing detritus and large woody debris, riparian forest buffer management must maintain a minimum of 50 percent canopy cover. To achieve benefits provided by large woody debris,

natural mortality of trees and large shrubs may need to be supplemented by periodically falling and placing selected stems or large limbs within water courses and water bodies to reach original design specifications.

For providing habitat and corridors for wildlife, manage the buffer to favor food, shelter and nesting cover that would satisfy the habitat requirements of the indicator or target wildlife. Refer to Habitat Evaluation Procedures by the U.S. Fish and Wildlife Service or equivalent state document for the particular species.

For purposes of reducing excess pollutants in surface runoff and shallow groundwater (zone 1, 2 and 3), or providing habitat and corridors for wildlife (zone 1 at a minimum), manage the dominant canopy to maintain maximum vigor of overstory and understory species.

Any use of fertilizers, mechanical treatments, prescribed burning, pesticides and other chemicals to assure buffer function shall not compromise the intended purpose. Biological control of undesirable plant species and pests (e.g., using predator or parasitic species, or grazing of domestic animals) shall be implemented where available and feasible.

Additional operation and maintenance requirements shall be developed on a site-specific basis to assure performance of the practice as intended. These will follow the general specifications for this practice.

REFERENCES (EXAMPLES)

American Fisheries Society, 1991. Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats. Special Publication 19, Editor: William R. Meehan. Bethesda, MD.

California Department of Fish and Game, 1994. California Salmonid Stream Habitat Restoration Manual. Second Edition. Prepared by: Gary Flosi and Forrest L. Reynolds. Sacramento, CA.

Olson, Rich and W.A. Hubert, 1994. Beaver: Water Resources and Riparian Habitat Manager. University of Wyoming. Laramie, WY.

Rosgen, David L. 1994. A Classification of Natural Rivers. Catena: An Interdisciplinary

Standard - 391A-8

Journal of Soil Science, Hydrology, Geomorphology, Vol. 22, No. 3, Elsevier Science. Amsterdam, Netherlands.

Schultz, R.C., J.P. Colletti, T.M. Isenhardt, W.W. Simpkins, C.W. Mize, and M.L. Thompson. 1995. Design and Placement of a Multi-species Riparian Buffer Strip. Agroforestry Systems 29:201-225.

State of Maryland, Department of Natural Resources, Public Lands, Forest Service, 1993. Soil Erosion and Sediment Guidelines for Forest Harvest Operations in Maryland. BMP Pocket Guide. Annapolis, MD.

U.S. Department of Agriculture, Forest Service, Northeastern Area State and Private Forestry, 1991. Riparian Forest Buffers -- Function and Design for Protection and Enhancement of Water Resources. NA-PR-07-91. Prepared by: David J. Welsch. Radnor, PA.

U.S. Department of Agriculture, Forest Service, Southern Region, 1992. Stream Habitat Improvement Handbook. Tech. Publ. R8-TP 16. Prepared by: Monte E. Seehorn, Atlanta, GA.

U.S. Department of Agriculture, Forest Service, Intermountain Research Station, 1989. Managing Grazing of Riparian Areas in the Intermountain Region. General Technical Report INT-263. Prepared by: Warren P. Clary and Bert F. Webster. Ogden, UT.

U.S. Environmental Protection Agency, 1991. Monitoring Guidelines to Evaluate Effects of Forestry Activities on Streams in the Pacific Northwest and Alaska. EPA/910/9-91-001. Prepared by: Lee H. MacDonald with Alan W. Smart and Robert C. Wissmar. Seattle, WA.